



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,346	11/18/2003	Ming Zheng	CL2221USNA	7632
23906 7590 04/24/2008 E I DU PONT DE NEMOURS AND COMPANY LEGAL PATENT RECORDS CENTER BARLEY MILL PLAZA 25/1122B 4417 LANCASTER PIKE WILMINGTON, DE 19805				
EXAMINER				
FORMAN, BETTY J				
ART UNIT		PAPER NUMBER		
1634				
NOTIFICATION DATE		DELIVERY MODE		
04/24/2008		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTO-Legal.PRC@usa.dupont.com

### Office Action Summary

**Application No.**

10/716,346

**Applicant(s)**

ZHENG ET AL.

**Examiner**

BJ Forman

**Art Unit**

1634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 and 27 is/are pending in the application.
- 4a) Of the above claim(s) 1-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-24 and 27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/5508)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**FINAL ACTION**

***Status of the Claims***

1. This action is in response to papers filed 17 February 2008 in which the previous rejections were traversed. Applicant's arguments have been thoroughly reviewed, but are not found persuasive for reasons discussed below.

The previous rejections in the Office Action dated 13 September 2007 are maintained.

Claims 21-24, 27 are under prosecution.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 21-24, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buzaneva et al (Mat. Sci. Eng. C, January 2002, 19:41-45) and Yerushalmirozen et al (WO 02/076888, filed 25 March 2002).

Regarding Claim 21, Buzaneva et al disclose a complex comprising unfunctionalized carbon nanotubes and single stranded nucleic acid (i.e. unwrapped double helix) wherein the complex is dispersed in solution prior to droplet deposition (page 42 and Abstract). The solution composition prior to deposition is encompassed by the claimed dispersion. Furthermore, the reference defines the "unwrapped double helix" as destroyed hydrogen bonding of the double helix in the presence of NaOH, which is illustrated by the hyperchromatic shift (page 41-42).

Regarding Claim 22, Buzaneva et al disclose the complex wherein the nucleic acid is DNA (Abstract).

Regarding Claim 23, Buzaneva et al disclose the complex wherein the nucleic acid is synthetic and/or isolated from nature (page 42, left column).

Regarding Claim 27, Buzaneva et al disclose the complex wherein the nucleic acid is metalized (i.e. Pt/Ir tip-DNA, page 42, left column).

Buzaneva et al teach the complex is useful for controlled construction of DNA motifs into periodic matter (page 41). Buzaneva et al do not specifically teach a dispersion of DNA-nanotubes. However, Yerushalmirozen teaches dispersed nanotubes in a stable suspension that are useful complexes for controlled construction of materials (Abstract). Yerushalmirozen et al further teach the nanotubes consist of single-walled nanotubes wrapped by charged, hydrophilic polymers e.g. polypeptides (page 5, line 10-page 6, line 8). Yerushalmirozen et al also teaches that the dispersion enables introduction of the nanotubes into any system, in any form and quantity and provides for highly adhesive interfaces between the tube and a polymeric matrix (page 8, lines 4-20).

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the nanotube dispersion of Yerushalmirozen et al to the complexes of Buzaneva et al. One of ordinary skill in the art would have been motivated to do so for the expected benefit of enabling introduction of the nanotubes into any system, in any form and quantity and provides for highly adhesive interfaces between the tube and a polymeric matrix (as desired in the art, Yerushalmirozen et al: page 8, lines 4-20).

Alternatively, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to apply the DNA polymers of Buzaneva et al to the polymer matrix of wrapped nanotubes of Yerushalmirozen et al. One of ordinary skill in the art would have been motivated to do so for the expected benefit of providing highly structured DNA motifs as desired in the filed of DNA nanotechnology (Buzaneva et al, page 41).

#### **Response to Arguments**

4. Applicant asserts that the Office misunderstands the meaning of "dispersion" as recited in the claim and further asserts that the "common definition" for the term is "a stable or unstable system of fine particles, evenly distributed in a medium". From this, Applicant asserts that the claimed dispersed nanotubes differ from the nanotube mixture of Buzaneva.

The assertions are noted, but are not found sufficient to overcome the above rejection. As discussed above and noted by Applicant, Buzaneva teaches DNA-nanotube complexes in a solution mixture (page 41-42). Yerushalmirozen is cited for a teaching of dispersion and the desire for obtaining dispersed polymer-nanotube complexes. Hence, it is the combined teaching of the references that obviates the instantly claimed invention.

Furthermore, Applicant's definition of dispersion is noted, however it is one of many definitions commonly used for the term. The definition reproduced below can be found at "dictionary.reference.com/browse/dispersed". Given the differing interpretations of the term "dispersed", Applicant cannot rely on Applicant's stated "common definition". Therefore, arguments regarding Applicants interpretation of "dispersed" are not commensurate in scope with the claims.

Dictionary.com Unabridged (v. 1.1) -

dis·perse

1. to drive or send off in various directions; scatter: *to disperse a crowd.*
2. to spread widely; disseminate: *to disperse knowledge.*
3. to dispel; cause to vanish: *The wind dispersed the fog.*
4. *Physical Chemistry.* to cause (particles) to separate uniformly throughout a solid, liquid, or gas.
5. *Optics.* to subject (light) to dispersion.  
-verb (used without object)
6. to separate and move apart in different directions without order or regularity; become scattered: *The crowd dispersed.*
7. to be dispelled; be scattered out of sight; vanish: *The smoke dispersed into*

*the sky.*

*-adjective*

8. *Physical Chemistry*, noting the dispersed particles in a dispersion.
- .....

Applicant points to Fukushima et al and the instant specification Fig 3A for a teaching of known optical characteristics of dispersed SWNT. The citations are noted. However, the claims are not limited to the SWNTs as described in the instant specification (page 17, lines 14-27 are reproduced below:

In a typical experiment, 10 mg of CNT were suspended in 10 mL of 1.times.SSC buffer (0.15M NaCl, 0.015M sodium citrate), then sonicated for 2 min with a TORBEO 130-Watt Ultrasonic Processor (Cole-Parmer Instrument Company, Vernon Hills, Ill.). Nucleic acids were dissolved in H.sub.2O to give a final concentration of 10 mg/mL. 50 .mu.L of the CNT suspension and 5 .mu.L of 10 mg/mL nucleic acid solution were added to 200 .mu.L of H.sub.2O to give a final volume of 255 .mu.L. The mixture was sonicated for 3 min., followed by 90 min of centrifugation at 16,000 g (Biofuge fresco, Kendro Laboratory Products, Newtown, Conn.). The supernatant was then removed for spectroscopic measurement. Absorption spectra from 400 nm to 900 nm were recorded using Ultrospec 3300 UV-Vis spectrophotometer (Amersham Biosciences, Piscataway, N.J.). The 730 nm peak was taken as a measure of the yield of the dispersion process.

Hence, the SWNTs having the optical characteristics of Fig. 3A are but one embodiment encompassed by the claims. The instant claims are not defined by a suspension solution, or sonication, or SWNT concentration, or nucleotide length (e.g. C/T 30 of Fig. 3A) or any of the other environments required to obtain the optical characteristics described in the specification. Additionally, the optical characteristics of dispersed SWNT presented in the Fukushima reference are prepared in ionic liquids and within DNA polymers. Hence, Applicant cannot

rely of the optical characteristics of the Fukushima SWNT to define the instantly claimed SWNT.

Applicant asserts that one of ordinary skill, using hindsight reasoning, might be able to obtain the instantly claimed SWNT by combining the teaching of Yerushalmirozen to that of Buzaneva.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant further asserts that there would be no reasonable expectation of success to do so because the obtainment of DNA-dispersed carbon nanotubes is dependent upon how much DNA is used relative to the dispersant polymer used in Yerushalmirozen, but Buzaneva does not disclose how strong the DNA-SWNT interaction is. The argument has been considered but is not found persuasive because the arguments are not supported by any factual evidence of inoperability. Therefore, the arguments are deemed unsupported arguments of counsel.

The arguments of counsel cannot take the place of evidence in the record. In re Schulze, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965). Examples of attorney statements which are not evidence and which must be supported by an appropriate affidavit or declaration include statements regarding unexpected results, commercial success, solution of a long-felt need, inoperability of the prior art, invention before the date of the reference, and allegations that the author(s) of the prior art derived the disclosed subject matter from the applicant. (see (MPEP 716.01(c)).

Finally, Applicant argues that Yerushalmirozen does not teach dispersion of DNA nanotubes. Applicant is reminded that the instantly claimed invention is deemed obvious over the combination of Yerushalmirozen and Buzaneva.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

It is maintained that the combined teaching obviates the invention as discussed above.

### **Conclusion**

No claim is allowed.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BJ Forman whose telephone number is (571) 272-0741. The examiner can normally be reached on 6:00 TO 3:30.



Art Unit: 1634

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BJ Forman  
Primary Examiner  
Art Unit 1634

/BJ Forman/  
Primary Examiner, Art Unit 1634